



Bridging the Gap: How Real-Time Data Can Contribute to Adaptive Management in International Development



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BRIEFING PAPER

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Key Messages

The ongoing digital revolution has seen rapid growth in the deployment of technology enabled real-time data initiatives in international development and humanitarian work, developed with the goal of accelerating decision-making processes and enhancing aid effectiveness and efficiency.

In parallel, there has also been a growing emphasis on adaptive and flexible approaches as the means by which to achieve better development results, by designing, managing and evaluating programs in ways that enable decision makers to navigate complexity and uncertainty, and find solutions that are 'best fit' rather than 'best practice'.

Both of these emerging movements share a focus on better, more timely and more effective generation and use of data, information, knowledge and insight across multiple levels, from the grass roots to policymakers.

Potential synergies between the two movements have so far been under-explored

Real-time data initiatives could work in tandem with adaptive management efforts, with mutual benefits for both areas of work, and for development efforts as a whole. To achieve these in practice, more systematic learning from experience is needed to identify key factors that might underpin real-time adaptive programming.

Based on the findings of a literature review and interviews with experts, a number of areas have been identified that can inform such learning. These include: the **design, development and implementation of real-time data systems**; the **processes by which data are collected, analyzed, interpreted**; the means by which data are **shared and disseminated**; and the ways that data are used in **different kinds of decision-making processes**.

Introduction

Thanks to the ongoing digital revolution, our world is home to 'an unimaginably vast amount of digital information which is getting ever vaster ever more rapidly'. This data explosion has the potential to positively transform work in virtually every field of human endeavor. New initiatives to capitalize on the upsides of the digital data explosion abound – from improving business efficiencies, to anticipating crimes and holding governments to account. Equally numerous are the vigorous debates about how to mitigate the potential downsides of the data explosion, from how to manage growing quantities of data, to how to make them secure and ensure privacy for individuals and groups.

In the business world, whole sectors such as stock trading, retail, advertising and journalism have been disrupted – and in some cases even entirely displaced – thanks to the rise of new competitors who make strategic use of real-time digital data, analytics and service provision to meet consumer needs and demands in more responsive, anticipatory and cost-effective ways. In the public and not-for-profit worlds, the ubiquity and speed of data-driven processes have had an impact on efforts in fields as diverse as the military, civil protection, health, education, welfare and social protection, natural resource sustainability and community development.

In international development, the High Level Panel that United Nations Secretary General Ban Ki-Moon appointed to advise on the global development agenda after the 2015 Millennium Development Goals was among the first to call for a 'data revolution'. This was met with growing interest, discussions and efforts to understand, gather and apply different types of data to better address development challenges. The diffusion of mobile phones, tablet computers, digital sensors and other cheap information technologies, often in combination with analogue tools such as radio and paper-based surveys, have led to a whole host of applications of real-time data. These include:

- Lower-cost reporting by community members on critical issues, from health and education to environmental and conflict monitoring;
- Faster and more comprehensive reporting by frontline workers, on medical caseloads, equipment requirements, etc.;

- Rapid status updates of goods, services and assets through technological sensors, providing information on equipment performance, prices, climatic and weather conditions; and
- Opinion and attitude tracking through social media of political perspectives, views on services, etc.

In parallel with the digital development movement, interest has been growing among a diverse network of actors – donors, researchers, policymakers and practitioners – working in think tanks, government and international bodies, and civil society organizations in new and different approaches to development. Inspired by efforts in other fields, and an extensive body of work in political science, leadership thinking, complexity theory and evolutionary biology, many in the development sector are calling for more adaptive and flexible approaches, supported by more systemic and innovative ways of gathering, analyzing and using learning and evidence.

Synergies and resonances appear to exist between the potential contribution of the data revolution, and the improvements needed in development policy and practice.

This briefing paper is a preliminary output of the first systematic exploration of the nexus between real-time data and adaptive approaches to development programming. Specifically, the overall project seeks to answer the questions, when, where and how can real-time data contribute to adaptive management?

This briefing paper summarizes the emerging findings from the first phase of research, comprising some 56 interviews and a literature review of 120 books, papers and articles. It addresses the following questions in turn:

1. How can we define real-time data systems for development?
2. How do real-time data systems for development work?
3. How might real-time data contribute to adaptive management?

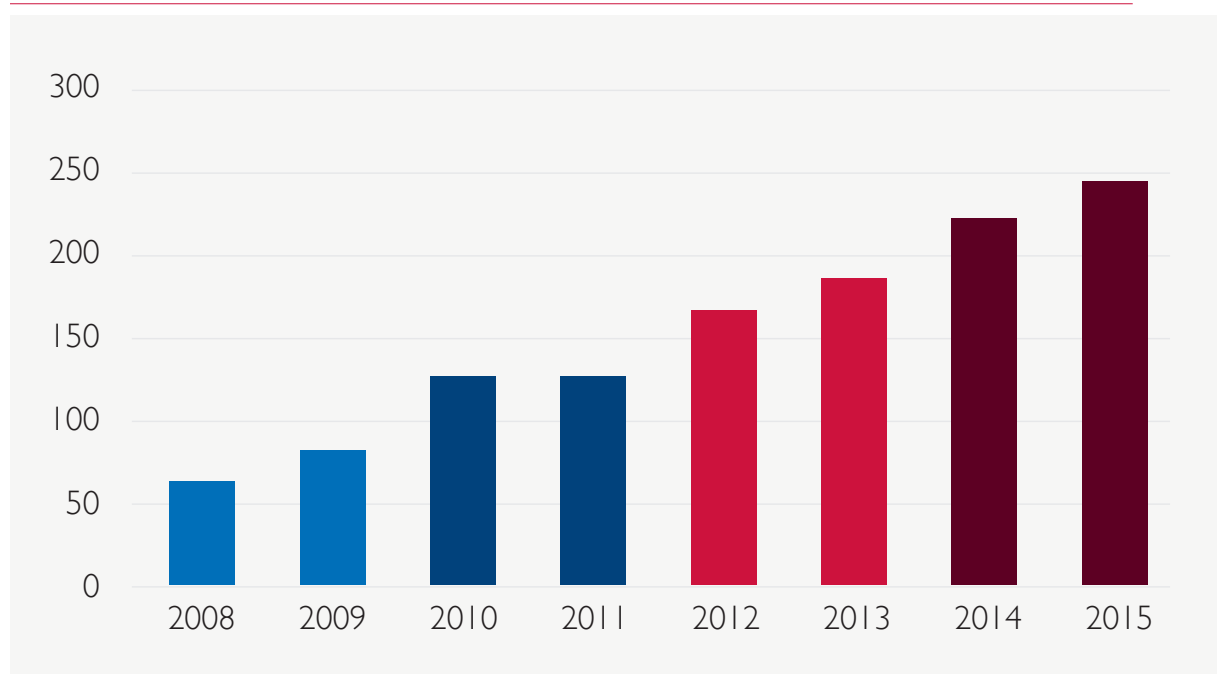
It closes with a brief summary of the forthcoming research work which will seek to explore these questions in more detail through a program of case study assessments of real-time data systems operating in different countries and addressing a range of development challenges.

How can we define real-time data systems for development?

The precise meaning of 'real-time' varies considerably from initiative to initiative and from context to context, both in development and more widely. Data thinktank TWDI (Transforming Data with Intelligence) found in a 2014 study that 'the term real time has become an umbrella concept encompassing multiple time frames, speeds, and execution frequencies' and that true real-time initiatives are relatively rare. This diversity can be attributed to the fact that most real-time data solutions are designed to satisfy a variety of business processes, which have different requirements in relation to the freshness of information, leading to variations in how fast and frequently data should be collected, processed, analyzed, delivered and used.

Our review of wider the literature on real-time data has identified a spectrum of meanings. At one end are initiatives where information is delivered immediately after collection, with no or very small delays – typically in the order of milliseconds – in the timeliness of the information provided. The most common application of such data is in the navigation systems of a wide range of vehicles or the tracking of physical assets and goods. At the other end are systems where data are dynamic, and are refreshed as changes and updates become available. Common applications include economic, financial or business transactions. With dynamic data, the flow is not constant, but instead updates can come at any time, with periods of inactivity in between. Changes in high-frequency dynamic data can be very rapid, and work in 'true' or 'near' real-time, but there may also be applications that are simply updated more frequently than existing data systems permit.

Figure 1: Number of articles containing both 'real-time data' and 'international development' (2008–2015)



Source: Google Scholar, IDS Analysis

How does this translate into the development sector's efforts in this area? Although efforts to use real-time data are not purely or even primarily an academic discipline, the growth of published articles that use both of the terms 'international development' and 'real-time data' in recent years is a useful indicator of a steady growth in interest in such systems (see Figure 1).

This growth can and should be understood in the context of the diverse meanings set out above. Specifically, it is arguably more representative of the growth in use of the term 'real-time data', rather than indicative of growth of a specific kind of application. Indeed, from our review we found that development applications of real-time data are just as diverse as those in business. For example, thanks to technological

sensors, a number of what might be seen as true real-time data initiatives typically generate and share data instantly, with no delay; for example, data on water flow through pumps, weather conditions in specific locations, and so on.

Numerous dynamic data systems, for example, provide information on changes in market prices, the health status of populations or the supply of goods through a supply chain. A number of these are seen as real-time simply because they use technology to collect data more frequently and more regularly than existing, traditional systems. For example, the World Bank uses 'high frequency data' to describe digital collection and modelling systems that enable pictures of poverty to be captured more frequently between more comprehensive surveys. In other settings, real-time data systems use mobile phones to share teacher absenteeism or cases of malnutrition on a weekly basis as opposed to monthly or every six months.

Because of this variation, some have called for the term '**right-time data**' – meaning data systems that are designed to match the decision-making requirements of specific problems or processes – to replace 'real-time data'. However, this alternative has not been especially popular in development or further afield. In light of the work done so far, we see value in defining real-time data as follows: 'Real-time data initiatives are those that employ digital technologies, typically involving mobile technologies and related software applications, to enable and accelerate the collection, sharing, management, analysis and reporting of data and inform more rapid and more timely decision making.'

How do real-time data systems for development work?

In common with all data systems, real-time data systems for development work by integrating processes for collection, storage and analysis, interpretation, and sharing of data on a wide range of development issues, from disease tracking to citizen accountability, and from school performance to commodity price monitoring.

Real-time data systems can be distinguished from more routine or traditional data systems because of the

focus on **the instant and/or dynamic collection and sharing of information** relating to a wide a variety of development challenges or phenomena. Real-time data processes are those that occur **as those phenomena are occurring**.

The ultimate aim of real-time data efforts, then, is to inform and underpin better, faster and more appropriate decisions by different development actors, ranging from community members to, practitioners, policymakers and researchers. By capitalizing on such innovations, it is argued that international and national institutions will be able to improve their capacity to design relevant policies; deliver better, more relevant and appropriate programs; and provide more convincing demonstrations of development progress towards desired goals.

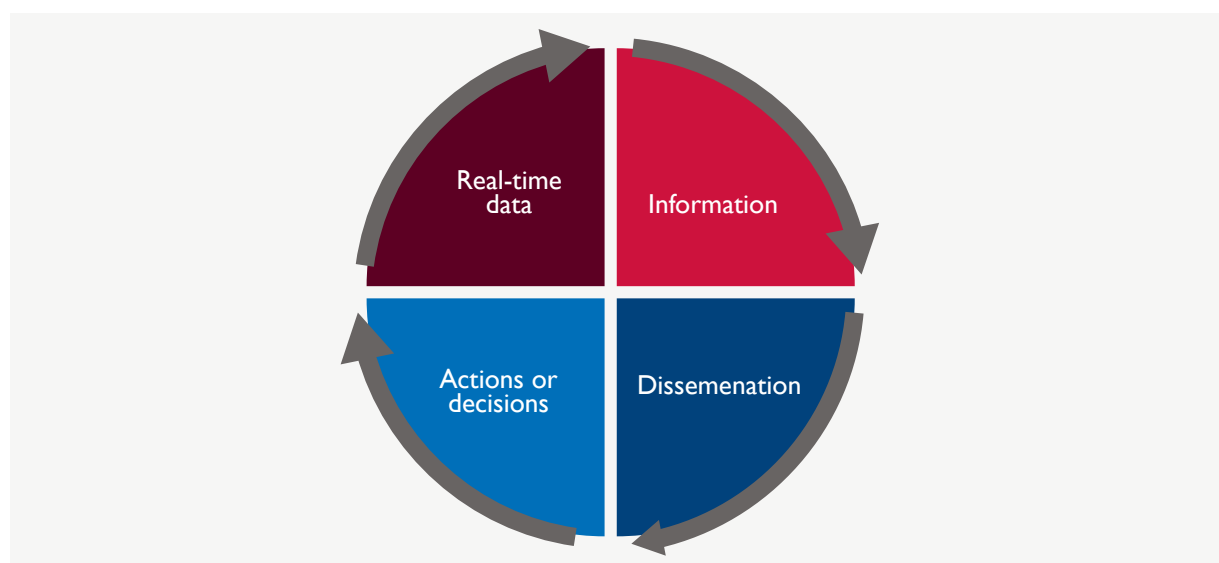
Digital technologies are increasingly vital for such data collection and sharing – including digital sensors, mobile phones, tablets and handheld computers. Of these, mobiles and short-message services (SMS) – text messages – are widely used for real-time data systems in international development because of their widespread availability, affordability and relatively easy use in low- and middle-income countries.

In common with other forms of data systems, real-time data systems can be thought of in the following four stages:

- **Stage 1** – Data are **collected** through the design and implementation of **real-time data** systems, technologies and applications.
- **Stage 2** – Data are consolidated, analyzed, interpreted and transformed into **information**.
- **Stage 3** – Information is **disseminated** and communicated to users in a variety of forms.
- **Stage 4** – User uptake of information leads to **actions or decisions** in response.

These stages should not be seen as a one-way flow, but rather as linked together in a cyclical process (see Figure 2).

Figure 2: The real-time data cycle



Source: Barnett and Edwards, 2014

This cycle can be seen across a wide variety of different real-time data systems and processes that often overlap or act in conjunction. These include, but are not limited to:

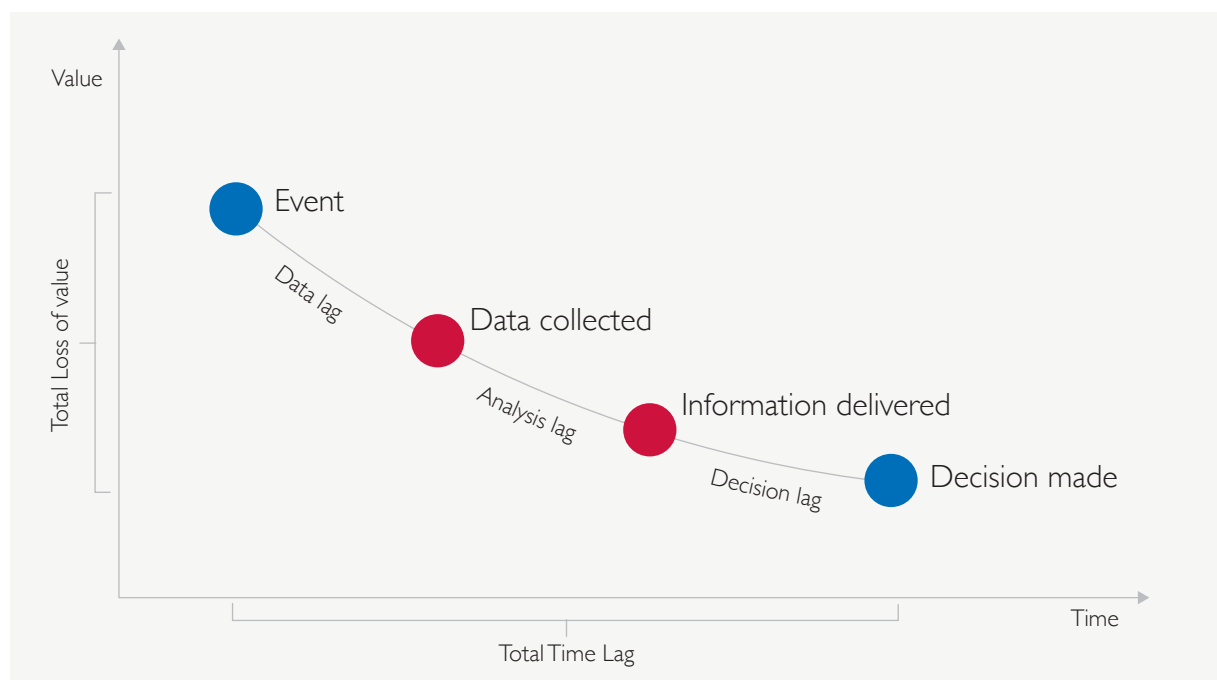
- **Community-based monitoring systems** – As the name implies, such systems emphasize community involvement throughout the real-time data process, from data collection to, sharing, analysis and use. These systems seek to gather perspectives and information from individuals or community representatives. Data are then aggregated either through automated or human effort, or a combination of the two. There are frequently concerns about the representativeness, validity and trustworthiness of such sources.
- **Sentinel site surveillance systems** – Such systems are more formal than community-based systems and use frontline workers or other trusted parties to track different phenomena in selected sites (e.g. institutions, communities, specific groups or project sites). Sentinel site surveillance systems aim to provide early warning of a problem rather than representative data sets.
- **Routine data systems** – These are relatively inexpensive and generate time-series data to allow more detailed analysis including over-time trend analysis and interpretation. They include data that official service delivery systems generate, for example, as well as other data-gathering mechanisms such as poverty surveys or health assessments by academic or other bodies.
- **Surveys** – Household and community surveys focus on generating statistically representative data that can be closely mapped to welfare outcomes, and demographic and social traits. Because of the resource- and time-intensive data collection processes for surveys, they are often weak at capturing rapid change, even when intended to be real-time.
- **Social media sources** – Social media platforms including Twitter, Facebook, and WhatsApp can be sources of information about user perspectives, perceptions and ideas. While such systems can be very good for short-term analysis, they often suffer from bias, as technology usage differs across population groups.
- **Data exhaust** – this is data generated as a by-product of user interaction with digital devices, applications, and websites – including phone call detail records, text messages, web-based transactions, web search enquiries, web browser histories. These data types are increasingly seen as valuable for effective real-time data systems.

The timeliness and speed of the real-time data cycle is primarily what distinguishes it from more traditional data-driven systems or processes. By bringing together these technologies with software tools, organizational processes and decision makers, real-time data initiatives have sought to accelerate the collection, storage and

transfer, analysis, interpretation, and sharing of data on a wide range of development issues.

Specifically, real-time data efforts seek to reduce the time lags that currently exist between data collection, analysis and use in decisions. These lags can lead to lost opportunities and greater costs, as shown in Figure 3.

Figure 3: Time lags and value lost due to lack of real-time data



Source: adapted from TWDI, 2014

How might real-time data systems contribute to adaptive management?

Champions of real-time data systems argue that such systems can provide relevant and timely data-driven insights on a range of development challenges, and by extension, inform better development policies and programs. Real-time data systems clearly have

potential to link to and support 'rapid cycles of planning, action, reflection and revision' that underpin adaptive management for development. What benefits does this interaction deliver, when it works in practice? The literature review and interviews undertaken for this project show that real-time data systems can benefit decision makers in a number of ways that resonate with the principles of adaptive management (see Table 1).

Table 1: The benefits of real-time data systems for development

Type of benefit	Explanation
Opening up to new understanding and voices	To gain understanding of events as they unfold, often from novel and disregarded perspectives and voices; for example, how populations might be mobilizing in response to a disease outbreak using real-time tracking of mobile phone call data
Enabling rapid and timely responses	Monitoring of specific indicators – asset quality, changes in performance, cases of diseases, behavioral changes – and using these to inform immediate decisions and responses
Optimizing resources	Tracking the use, level and location of critical resources – such as drug stocks, food levels, vehicle drivers – and using this information to manage operations more efficiently and effectively
Sharing collective learning and perceptions	Tracking in real time how people are reacting to or discussing specific phenomena – from responding to a new consumer product to learning how to deal with specific weather conditions, to generating perspectives on a new policy or the quality of a critical service such as education or health – and using this to inform decisions about policies and practices
Type of benefit	Explanation
Understanding and managing systems	Real-time data systems that provide a comprehensive system- or network-wide view of key challenges, processes or functions can enable systems stewardship. Widely used in the military and manufacturing, such systems are starting to be used in humanitarian operations, environmental management, and health and education systems-strengthening efforts
Adapting and scaling new business models	Real-time data systems can enable new business models for development organizations and businesses to emerge and be taken to scale. For example, the combination of mobile data capabilities with financial services has enabled more inclusive financial services for poor communities. Along similar lines, mobile money is now being used in combination with off-grid solar energy systems to expand energy services to poor communities
Anticipation and building resilience	A range of real-time data solutions have enabled decision makers to shift from reactive solutions to anticipatory approaches. For example, resilience-related systems are already in place in a number of settings that anticipate spikes in food prices, extreme weather or other events that could affect the lives of poor and vulnerable people. These can also be used within operations and logistical systems, such as food or supply delivery, to anticipate bottlenecks or other problems, and respond through contingency planning

There are also costs and risks to real-time data systems that need to be considered in development contexts, including the accessibility and coverage of systems,

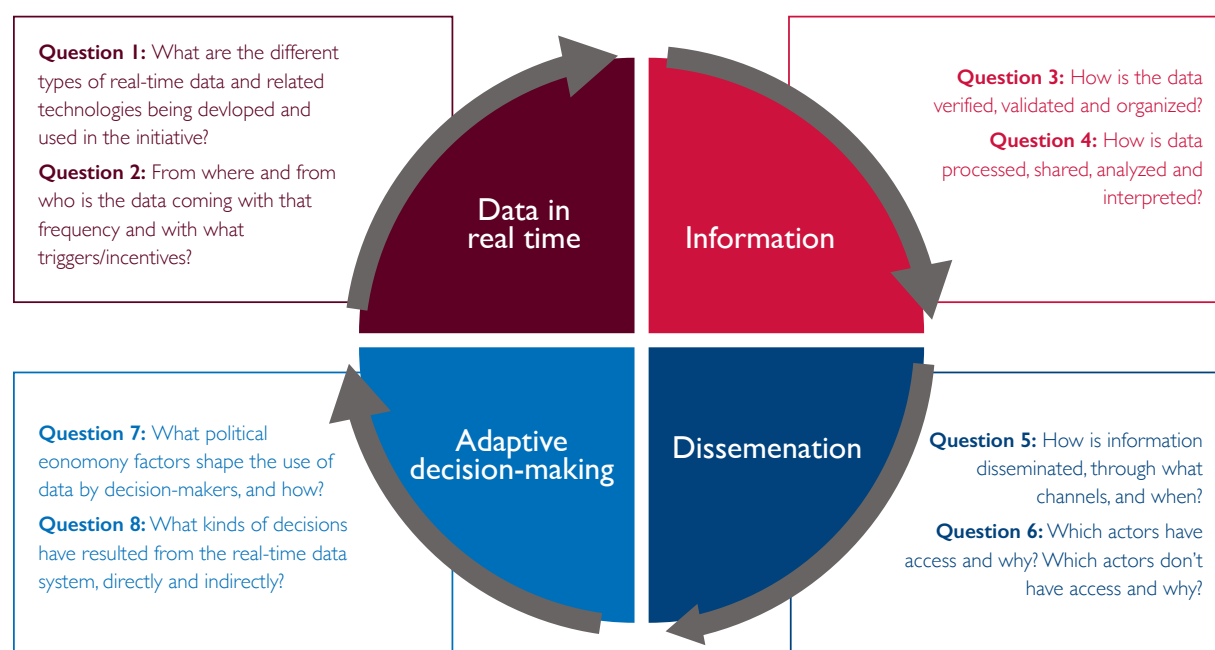
especially in relation to the poorest communities, as well as challenges around privacy, security and control of data.

What's next?

By synthesizing the lessons learnt so far, we have developed a preliminary framework to guide our investigation (Figure 4), with a series of illustrative questions emerging from the work to date.

Building on this work, the project consortium is now setting out to explore specifically **when, where and how real-time data systems can contribute to adaptive management** in international development.

We are looking at a diverse set of case studies across government service delivery of nutrition, strengthening urban resilience, agricultural market development, and citizenship and identity. In doing so, we hope to better understand the limits and possibilities of 'real-time adaptation' in development, and what synergies, if any might be achieved, between these two important movements to change development practices for the better.



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